

**Scientific Report on the Belgian Expedition
to The Great Barrier Reef in 1967.
Nematodes XIII.* A Description of Four New
Species and a Redescription of Four Known Species
from in and around Mangroves on Lizard Island**

W. Decraemer and A. Coomans

Instituut voor Dierkunde, Rijksuniversiteit, Gent,
Ledeganckstraat 35, B-9000 Belgium.

Abstract

Four new nematode species are described: *Theristus quadripapillatus*, sp. nov., distinguished from all known species of the genus in possessing four genital supplements, in the structure and shape of the gubernaculum, and in possessing a glandular tube parallel with the anterior testis and opening into the vesicula seminalis; *Acanthopharynx distechei*, sp. nov., characterized by its head shape with smooth helmet bearing 24 subcephalic setae, by the elongated loop-shaped amphids, and in males by possessing only one pre-anal papilla; *Ptycholaimellus lizardiensis*, sp. nov., characterized in males by the shape of the gubernaculum with two lateral pieces with an enlarged, dentated distal end, and by the presence of a small pre-anal papilla; and *Paracanthonchus parahartogi*, sp. nov., characterized by having an outer circle of 10 minute setose sense organs, by having a very small tooth, and in males by the shape of the copulatory apparatus and the six pre-anal supplements.

For four known species additional information is given: *Paracomesoma dubium* (Filipjev, 1918) Stekhoven, 1950; *Actinonema longicaudatum* (Steiner, 1918) Wieser, 1954; *Halichoanolaimus quattuordecimpapillata* Chitwood, 1951; and *Bathylaimus australis* Cobb, 1894.

Introduction

This paper presents the description of four new nematode species: *Theristus quadripapillatus*, sp. nov.; *Acanthopharynx distechei*, sp. nov.; *Ptycholaimellus lizardiensis*, sp. nov.; and *Paracanthonchus parahartogi*, sp. nov.

Four known species are redescribed or additional information is given: *Paracomesoma dubium* (Filipjev, 1918) Stekhoven, 1950; *Actinonema longicaudatum* (Steiner, 1918) Wieser, 1954; *Halichoanolaimus quattuordecimpapillata* Chitwood, 1951; and *Bathylaimus australis* Cobb, 1894.

Ecological notes on the nematode fauna of the two small mangrove swamps and the adjacent sandy beaches on Lizard Island, Great Barrier Reef, where the species described have been found, are given in another paper (Decraemer and Coomans 1978).

Materials and Methods

The descriptions are based on specimens found at the localities listed in Table 1, fixed with 5% (v/v) formaldehyde (samples 1, 3 and 8) or 4 : 1 F.A. (10 ml formalin, 1 ml glacial acetic acid, 89 ml distilled water) (samples 2 and 4) and mounted in glycerine. The descriptions of the localities and samples are given separately (Decraemer and Coomans 1978).

The holotype material is deposited in the collection of the Instituut voor Dierkunde, Rijksuniversiteit, Gent, Belgium. Some paratype specimens are deposited in the Queensland Museum, Brisbane, Qld.

* Part XII, Aust. J. Mar. Freshwater Res., 1978, 29, 497-508.

Table 1. Locality of species described from Lizard Island

Locality	Date	Habitat	Species found and described
Near mangrove swamp A Sample 1	11.ix.67	Sandy beach	<i>Paracomesoma dubium</i> 4 ♀, 16 ♂, 24 juv. <i>Actinonema longicaudatum</i> 6 ♀ <i>Psycholaimellus lizardiensis</i> 2 ♀ <i>Halichoanolaimus quattuordecimpapillata</i> 1 juv. <i>Bathylaimus australis</i> 1 ♀, 1 ♂, 6 juv.
Sample 2	11.ix.67	Sand near outer margin of the mangrove	<i>Paracomesoma dubium</i> 11 ♀, 13 ♂, 28 juv. <i>Actinonema longicaudatum</i> 11 ♀, 6 ♂, 1 juv. <i>Halichoanolaimus quattuordecimpapillata</i> 3 ♀, 1 ♂, 4 juv. <i>Bathylaimus australis</i> 5 ♀, 7 ♂, 6 juv.
Sample 3	11.ix.67	Sand and algal mats at c. 10 m from the mangrove	<i>Acanthopharynx distechei</i> 1 ♀, 1 ♂, 9 juv. <i>Psycholaimellus lizardiensis</i> 5 ♀, 1 ♂, 5 juv. <i>Paracanthochus parahartogi</i> 4 ♀, 3 ♂, 21 juv. <i>Halichoanolaimus quattuordecimpapillata</i> 1 juv.
Near mangrove swamp B Sample 4	31.viii.67	Coarse sand at water-line on Watson's Beach	<i>Theristus quadripapillatus</i> 3 ♂, 5 juv. <i>Psycholaimellus lizardiensis</i> 1 juv.
In mangrove swamp B Sample 8	15.ix.67	Fine sand and plant detritus in the mangrove channel	<i>Psycholaimellus lizardiensis</i> 1 juv.

Explanation of Abbreviations Used

- a m = anal muscles
 a b d = anal body diameter
 amph = diameter of the amphids (length \times width)
 a pr spic = anterior protractor spiculi
 bd = body diameter halfway along body length
 bd oes = body diameter at base of oesophagus
 bd vulva = body diameter at the level of the vulva
 c s = length of cephalic setae
 cop m = copulatory muscle
 ex p = distance of excretory pore from anterior body end
 gl = gland
 gub = length of gubernaculum
 hd = head diameter
 hd amph = head diameter at the level of the amphids
 hl = length of head
 incl gub = inclinator gubernaculi
 L = length of body
 l m = labial muscle
 L vulva = distance of vulva from anterior body end
 nr = position of nerve ring from anterior body end
 oes = length of oesophagus
 ovid = oviduct
 p pr spic = posterior protractor spiculi
 p gub = protractor gubernaculi
 r gub = retractor gubernaculi
 r spic = retractor spiculi
 sp₁ = anterior spermatheca
 sp₂ = posterior spermatheca
 sp duct₁ = duct of the anterior spermatheca
 sp duct₂ = duct of the posterior spermatheca
 sp sac₁ = anterior spermatheca sac
 sp sac₂ = posterior spermatheca sac
 spic = length of spicules, measured along the median line
 t = tail length
 te₁ = anterior testis
 te₂ = posterior testis
 ut = uterus
 V = position of the vulva as percentage of body length
 v def = vas deferens
 ves sem = vesicula seminalis

All measurements are in micrometres.

Theristus quadripapillatus, sp. nov.

(Fig. 1)

Measurements

<i>Holotype</i> ♂		<i>Paratype</i> ♂ (<i>n</i> = 2)		<i>4th-Stage juvenile</i> ♂ (<i>n</i> = 2)		<i>3rd-Stage juvenile</i> ♂ (<i>n</i> = 1)	
L	635	L	550-560	L	500-535	L	450
hd	6.5	hd	6.5-7.0	hd	5.5	hd	6
hd amph	8	hd amph	7.5	hd amph	7-7.5	c s	3.5
c s	5	c s	4.5	amph	4	bd amph	7.5
amph	7 by 7	amph	6.0-7.5 by 5.5-8.0	oes	143-145	amph	4
oes	165	oes	155-157	bd oes	20	oes	135
bd oes	24	bd oes	21-23	bd	20-23	bd oes	17
bd	28	a b d	22-25	a b d	19	bd	22
a b d	26	spic (R)	21-23	t	83-84	a b d	16
spic (R)	25	spic (L)	19-24			t	76
spic (L)	24	gub	20				
gub	20	t	85-90				
t	100						
				Indices of de Man		Indices of de Man	
Indices of de Man		Indices of de Man		<i>a</i>	21.7-26.7	<i>a</i>	20.4
<i>a</i>	22.6	<i>a</i>	22.0-24.3	<i>b</i>	3.4-3.6	<i>b</i>	3.3
<i>b</i>	3.8	<i>b</i>	3.5-3.6	<i>c</i>	5.9-6.4	<i>c</i>	5.9
<i>c</i>	6.3	<i>c</i>	6.2-6.4				

Male

Body slender, slightly tapered in tail region and more so in anteriormost body region where the body width is only $\frac{1}{3}$ of the body width at the level of the cardia. Cuticle finely annulated. Body bearing long and thin somatic setae; longest at mid-body (25 μm), shortest in narrowed anterior body region (8 μm) and in tail region (7 μm).

Head bears 10 fine cephalic setae: 4 are 4.5-5.0 μm long, 6 are 3 μm long. Labial region (2 μm long) consists of 6 low inconspicuous lips, each lip provided with a minute papilla hardly visible in lateral view.

Amphids thin-walled with central pore; approximately circular and 6-8 μm in diameter, maximally nearly as wide as corresponding body width or somewhat smaller; situated 22-23 μm from anterior extremity, i.e. about 3 times the corresponding head width. At level of the amphids body slightly constricted (Fig. 1B).

Stoma 4.0-4.5 μm deep, with cup-shaped structure as typical of the genus. Oesophagus mainly a narrow cylinder gradually widening in the posterior third, so that at its posterior end the oesophageal width (10 μm) is twice that of the anterior oesophageal region. Nerve ring surrounds the oesophagus at 58-61% of the oesophageal length.

Cardia about as long as wide (5.0-5.5 μm), slightly protruding into the cylindrical intestine. Rectum 15 μm long. Cloacal opening, a very large slit.

No excretory gland nor excretory pore observed.

Male reproductive system consists of 2 narrow elongated testes of which the posterior one is reflected. Testes followed by a single large vesicula seminalis with globular spermatozooids. Peculiar is the presence of a long narrow glandular blind-ending tube, connected with the anterior part of the vesicula seminalis. This organ lies parallel with and at the dorsal side of the anterior testis, reaching anteriorly

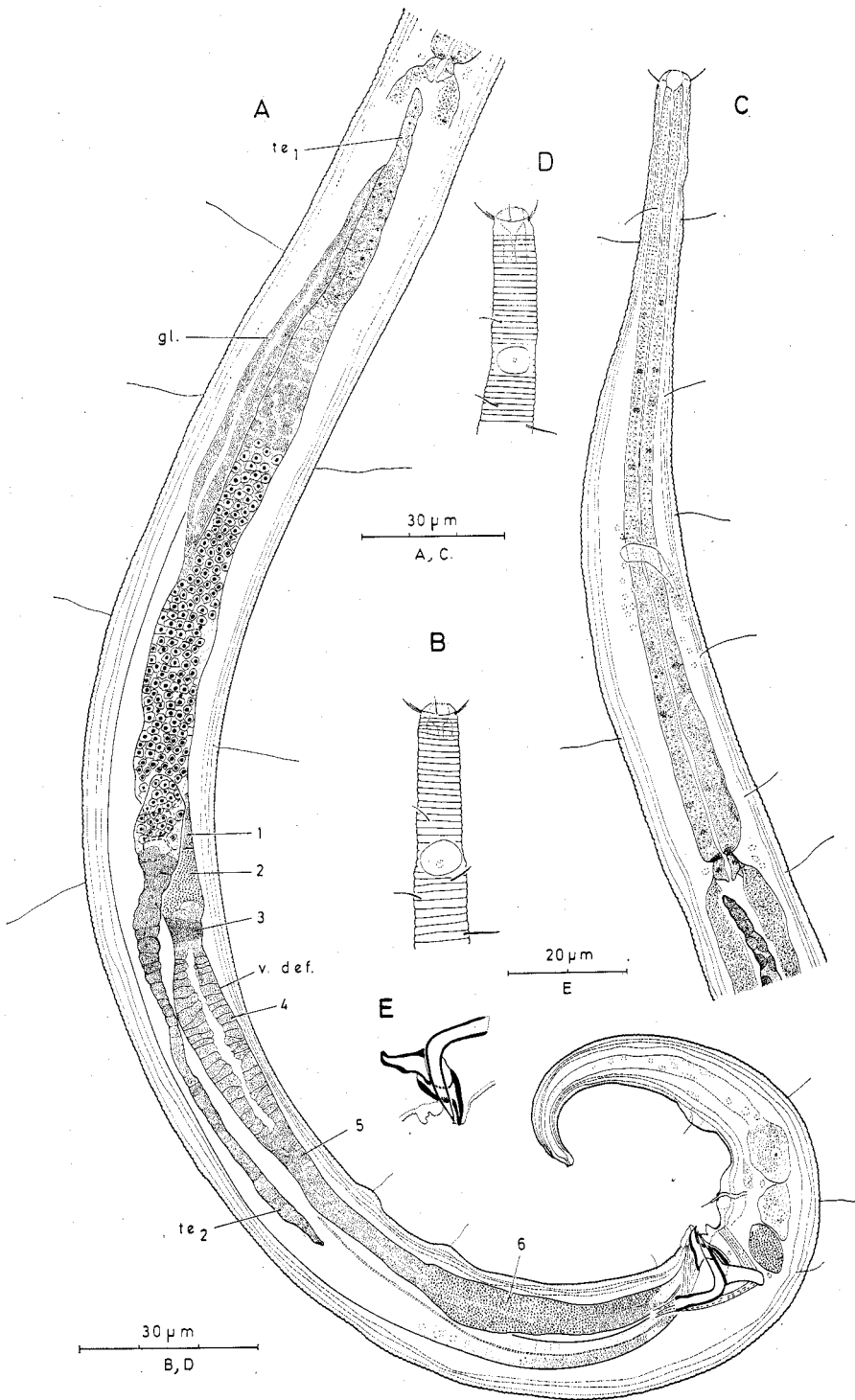


Fig. 1. *Theristus quadripapillatus*, sp. nov. *A*, Male reproductive system and tail region (holotype); *B*, surface view of anterior body region, lateral side (♂, holotype); *C*, anterior body region with oesophago-intestinal junction (♂, holotype); *D*, surface view of anterior body region, lateral side (♂, paratype); *E*, copulatory apparatus (holotype).

almost to the tip of the testis. A similar glandular structure discovered by Cobb (1930) is only known in Oncholaimidae where it has been considered as possibly homologous with parts of the demanian organs in females (see Rachor 1969, pp. 154-5). Vesicula seminalis followed by the vas deferens. In the vas deferens 6 zones can be distinguished: (1) a short anterior part consisting in lateral view of 4 large densely granulated polygonal cells, (2) a coarsely granulated part which continues through (3) a short constricted part into (4) a wider region with distinct lumen and a wall composed of numerous (about 20) pale, flattened cells, (5) a narrower part formed by cubic cells, and (6) a finely granulated wider posterior part opening into the cloaca.

Spicules rectangularly bent, possessing a slightly demarcated capitulum and a pointed tip. Muscles of the spicular apparatus consist per spiculum of (1) two well developed protractor muscles: an anterior protractor extending from the capitulum of the spiculum to the ventral body wall in front of the cloaca, and a posterior protractor extending from the capitulum to the proximal end of the apophysis of the gubernaculum, and (2) a forked retractor muscle inserting on the capitulum and running anteriorly towards the dorsolateral body wall.

Gubernaculum consists of a strongly sclerotized forked median part (9-10 μm long) and 2 weakly sclerotized lateral parts (11-12 μm long) parallel with the spicules and provided with well developed dorsocaudally orientated apophyses (8-9 μm long). A pair of gubernacular muscles connect the proximal end of both apophyses with the ventral body wall, apparently causing an inclination of the gubernaculum upon contraction.

Two pre-anal and 2 postanal, medioventral papillae present. Pre-anal papillae lie 67-76 and 54-57 μm from the cloacal opening and bear fine seta (10-11 μm long). Postanal papillae lie 12-15 and 30-34 μm behind the cloacal opening. Postanal papilla nearest to the cloaca is the largest of the supplements, showing a short tubular outlet.

Tail slender, gradually tapering posteriorly towards a minute spinneret. No terminal setae present.

Female

Not found.

Juveniles

Based on the development of the reproductive system the juveniles found were recognized as juvenile males probably belonging to two different juvenile stages: the 3rd and 4th stages.

Apart from the development of the genital system their characters agree with those of the adults.

In one of the 4th-stage juveniles the reproductive system was completely developed; the gland along the anterior testis was already present and the formation of the pre-anal and postanal papillae had started. In the spicular primordium dorsally along the rectum the beginning of the formation of the spicules and the median part of the gubernaculum could be observed. In a younger specimen of the same stage the reproductive system was almost completely formed except for the gland along the anterior testis. The spicular primordium was not yet differentiated into spicula and gubernaculum, nor were pre-anal and postanal papillae recognizable. The youngest juvenile found presumably belongs to the 3rd juvenile stage; it possesses

a genital system consisting of 2 testes, the future vesicula seminalis, and the beginning of the vas deferens. A spicular primordium is also present.

Type Locality and Habitat

Lizard Island, mangrove swamp B (sample 4).

Type Material

Holotype ♂: Lizard Island, slide No. 205. Paratypes from Lizard Island: 2 ♂, Nos A1484, A1469; two 4th-stage juveniles, Nos A1456, A1465; one 3rd-stage juvenile, No. A1465. 1 ♂ paratype (G 11604) deposited in the Queensland Museum.

Diagnosis

Theristus (T.) quadripapillatus, sp. nov., differs from all known species of *Theristus*, sensu stricto, in possessing 4 genital supplements in males (2 pre-anal and 2 postanal), in the structure and shape of the gubernaculum with a forked median piece, flanked by 2 lateral parts with well developed apophyses, and by the presence of a glandular tube parallel with the anterior testis and opening into the vesicula seminalis.

The new species is also characterized by the '*Rhynchonema*'-like form of the body such as in *T. rhynchonemoides* Hopper, 1961, *T. bastiani* Wieser in Gerlach and Riemann (1973) and *T. wimmeri* Wieser, 1959, and by the structure and position of the amphids: large thin-walled organs situated at about 3 times the head diameter from the anterior end.

T. quadripapillatus, sp. nov., is closest to *T. bastiani* Wieser in Gerlach and Riemann (1973) in habitus, in head shape, in the shape of the spicules, and in the measurements and position of the amphids. It differs, however, in the shape of the gubernaculum, the presence of genital supplements, the larger amphids in males (i.e. about as wide as the corresponding body width instead of 63% of the body width as in *T. bastiani*), and in the smaller number of somatic setae.

Acanthopharynx distechei, sp. nov.

(Fig. 2)

Measurements

<i>Holotype</i> ♂		<i>Paratype</i> ♀ (n = 1)		<i>Paratype juveniles</i> (n = 2)	
L	1750	L	2120	L	1020-1125
hd*	20	hd*	22	oes	240-255
hl†	20	hl†	25	t	105-110
amph	11 by 7	amph	10.5 by 7		
oes	360	oes	365		
bd oes	83	bd oes	78		
bd	89	bd vulva	104		
a b d	54	a b d	41		
t	126	t	110		
spic	117	L vulva	1220		
gub	45	V	57.5%		
Indices of de Man		Indices of de Man			
a	19.6	a	20.4		
b	4.8	b	5.8		
c	13.8	c	19.2		

* hd at base of subcephalic setae.

† hl to beginning of body annules.

Description

Body long and rather stout, slightly tapering anteriorly and in tail region. Body cuticle thick ($5\ \mu\text{m}$) and finely annulated except in head region and short terminal part of tail where it is thinner and smooth. Anteriorly in oesophageal region, annulation coarser than on the rest of the body where it is extremely fine. In longitudinal optical section 3 cuticular layers were distinguished: a very thin outer layer and 2 strongly annulated thick layers ($2\text{--}3\ \mu\text{m}$, Fig. 2*B*). In the only male specimen found, the outer cuticular layer suddenly becomes larger, i.e. from shortly posterior to the beginning of the vas deferens and continuing as a broad transparent layer to just in front of the cloaca; it is pierced by 27 ventral pores arranged in a double row. Body provided with longitudinal rows of minute setae ($1.5\text{--}2.0\ \mu\text{m}$) and fine pores (Figs 2*A*, 2*E*).

Just beneath the cuticle the somatic musculature forms a continuous thin layer of numerous fine brownish granules throughout the body. In the male specimen this granular layer is well developed on the ventral body side especially underneath the thickened cuticle, giving rise to a series of projections (Fig. 2*E*).

Head region differentiated from the rest of the body by a smooth cuticular helmet, tapering anteriorly towards a truncated end out of which the narrow lip region may protrude (Fig. 2*A*). Head cuticle becomes thinner anteriorly, so that opposite the dorsal tooth it is only $\frac{1}{3}$ as thick as the body cuticle. Labial region ($9.5\ \mu\text{m}$ wide) has a crown of 6 small papillae. Posteriorly, on the anterior margin of the helmet 4 cephalic setae ($3.0\text{--}3.5\ \mu\text{m}$ long) are implanted. Shortly behind and more outwards from the cephalic setae a circle of 24 subcephalic setae ($8.5\ \mu\text{m}$ long) is observed. Subcephalic setae more or less arranged in groups of 3, situated sublaterally, subdorsally and subventrally.

Amphids large (11 by $7\ \mu\text{m}$), forming an elongated loop and situated posteriorly to the circle of subcephalic setae, reaching to the 1st body annule.

Cheilostoma $7.0\text{--}7.5\ \mu\text{m}$ deep; its wall strengthened by 12 rugae. Rugae strongly sclerotized and becoming thicker posteriorly; they are separated by a slight constriction from the oesophageal tissue. There is a stout, hollow dorsal tooth ($4.5\ \mu\text{m}$ long) directed anteriorly into the base of the cheilostoma. Opposite the base of the dorsal tooth a small ventrosublateral tooth is observed in lateral view (Fig. 2*B*). In the anterior part of the oesophagus the lining of the lumen is strongly cuticularized. The narrower cylindrical anteriormost part of the oesophagus is surrounded by muscles (Fig. 2*B*). Posterior to the insertion of these muscles, the oesophagus becoming somewhat wider to near the nerve ring, where it diminishes somewhat in diameter. Nerve ring surrounds the oesophagus at $131\text{--}132\ \mu\text{m}$ from the extreme anterior end. Shortly behind the level of the nerve ring the oesophagus enlarges to an elongated bulb with strongly developed cuticular lining of the lumen and occupies $\frac{3}{5}$ of the total length of the oesophagus. In the male specimen the nucleus of one of the ventrosublateral glands was observed at the level of the posterior protoplasmatic interruption between the muscles.

Cardia ($21\text{--}23\ \mu\text{m}$ long) more or less triangular in shape in longitudinal optical view, consisting of a relatively large muscular part, posteriorly surrounded by intestinal tissue. Intestine cylindrical; its wall composed of rather small, finely granulated, polygonal cells. Rectum $57\ \mu\text{m}$ long, i.e. about 1.4 times the anal body width.

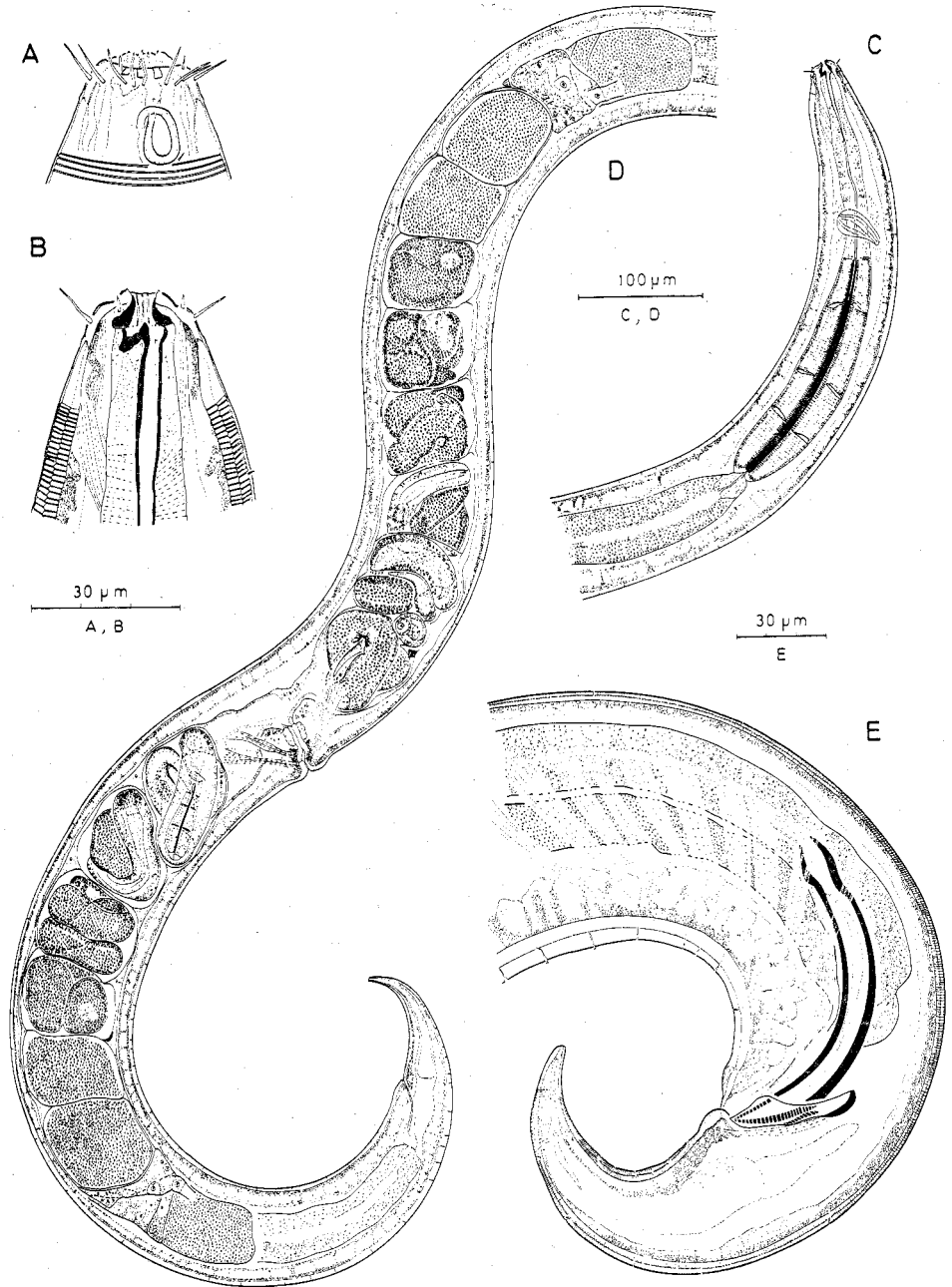


Fig. 2. *Acanthopharynx distechei*, sp. nov. *A*, Surface view of head, lateral side (holotype ♂); *B*, head region in longitudinal optical section (holotype ♂); *C*, anterior body region with oesophago-intestinal junction (♀ paratype); *D*, female reproductive system and tail region (paratype); *E*, posterior body region (♂ holotype).

An excretory gland was not observed, nor an excretory pore. In the male specimen and in two juveniles 2 groups of cells were observed subventrally on each side of the body at the level of the cardia; in the female specimen and a juvenile 2 similar groups of cells were observed: 1 right laterally and 1 left ventrosublaterally.

Male reproductive system with only 1 testis continuing into a large vesicula seminalis, followed by a narrower vas deferens.

Spicules 117 μm long (i.e. slightly more than twice the anal body width), stout and strongly arcuated. Its corpus has mainly parallel walls, only distally tapered to a pointed tip; proximally with an offset capitulum (15 μm long). Muscular system of spicular apparatus rather obscure in the specimen available, consisting per spiculum of a retractor split into 2 bands and a protractor (Fig. 2E).

Gubernaculum (45 μm long) a rather obscure structure consisting of a short trough-like median part surrounding the distal end of the spicules and connected with 2 lateral apophyses with a well cuticularized proximal end; each apophysis lies dorsocaudally along the spicules. From the muscular system of the gubernaculum only 1 pair of protractor muscles was observed extending from the top of the apophyses towards the ventral body wall just posterior to the cloaca.

Just anterior (at 9.5 μm) to the cloaca lies a rounded pre-anal papilla. The obliquely orientated copulatory muscles are well developed.

Female reproductive system didelphic-amphidelphic with reflexed ovaries. In both branches the oviduct leads to a large sac-like structure (spermatheca?), consisting of large cells, each with distinct nucleus and nucleolus. This structure is connected with the uterus. The only female specimen available is an old female with 8 eggs in the anterior uterus and 6 in the posterior one, showing in each branch a series with successive stages of development from an undivided cell to a completely developed juvenile. Thin-shelled eggs nearest to the ovaries have the following size: 81–83 μm length by 68–70 μm width ($n = 2$). Vulva with slightly elevated lips and well developed muscles. Cuticularized vagina extending nearly halfway across the body and surrounded by an obvious constrictor vaginae.

Tail conoid, ventrally curved; shorter and somewhat slenderer in the female than in the male. Three successive caudal glands with nucleus clearly distinguished only in juvenile specimens.

Type Locality and Habitat

Lizard Island, mangrove swamp A (sample 3).

Type Material

Holotype δ : slide No. 203. Paratypes: 1 ♀ , No. A5689; 5 juveniles, Nos A5620, A5667, A5697, A5698, A5634. One juvenile paratype (G 11605) deposited in the Queensland Museum.

Diagnosis

Acanthopharynx distechei, sp. nov., is characterized by its head shape with smooth cuticular helmet, by the anterior sense organs and the presence of 24 subcephalic setae and by the elongated loop-shaped amphids. It is characterized in males by the possession of a thickened pre-anal cuticle pierced by 27 pores and by having only one pre-anal papilla.

The new species is named in honour of Professor Dr A. Distèche, leader of the Belgian Expedition to the Great Barrier Reef in 1967.

Discussion

The Australian specimens closely resemble *Acanthopharynx nuda* (Cobb, 1920) Gerlach, 1963. Apart from the supplementary organs and the thickened pre-anal cuticle in males, they completely agree with the detailed description given by Cobb (1920). However no figure of the copulatory system was given by this author. The Australian specimens differ from *A. nuda* (1) in possessing only 1 rounded papilla not projecting from the body wall instead of 6 supplementary papillate organs occupying a distance equal to the length of the tail and projecting from the body wall, and (2) in having a thickened pre-anal cuticula pierced by 27 pores in males. It should be noted that there are peculiarities in the measurements given by Cobb (1920) of a male and a female specimen of *A. nuda*: (1) the female specimen has an *a*-value of de Man which is twice that of the male (43·5 as against 23·3), and (2) the length of the stoma is peculiar; the stoma was presumably interpreted differently in both sexes since in the male specimens it is 2·7% of the total body length and as long as the body width at this level, but in the female the stoma length is only 0·8% of the body length and $\frac{2}{3}$ of the body width at this level.

A comparable shape of the copulatory apparatus, the presence of a single pre-anal papilla, and the thickening of the cuticle of the ventral body, pierced by 12 pores in males, was recorded and figured for *A. micans* (Eberth, 1863) Marion, 1870, by Gerlach (1963, pp. 93–94, fig. 9*g–k*). The Australian specimens, however, clearly differ from *A. micans*, *inter alia*, in the arrangement and number of the subcephalic setae, the larger and elongated shape of the amphids instead of smaller and almost circular amphids as in *A. micans*, in the dentition of the stoma, i.e. without rows of denticles as in *A. micans*, in the body length which is nearly twice that of *A. micans*, and in the shorter gubernaculum and much shorter spicules, i.e. 49–55 μm as against 117 μm in *A. micans*.

Remarks

The male specimen identified as *A. micans* in Gerlach (1963) differs from the specimens described by previous authors by the possession of only 1 pre-anal papilla as against 7 (in a figure of Eberth 1863), 9 (Schuurmans Stekhoven 1950), 14 (Wieser 1954), and 1 large anal and 10 fine pre-anal papillae (Micoletzky 1924). The arrangement of Micoletzky (1924) is comparable with that found by Gerlach (1963) and with the Australian specimens, taking into account the fact that the fine pores in the thickened ventral cuticle were also considered as papillae by Micoletzky.

Parcomesoma dubium (Filipjev)

(Figs 3 and 4)

Comesoma dubium Filipjev, 1918, pp. 335–6.

Parcomesoma dubium Stekhoven, 1950, p. 149.

To add to the detailed description by Filipjev (1918) a further morphological study was made of the head region, the copulatory system and the internal organs.

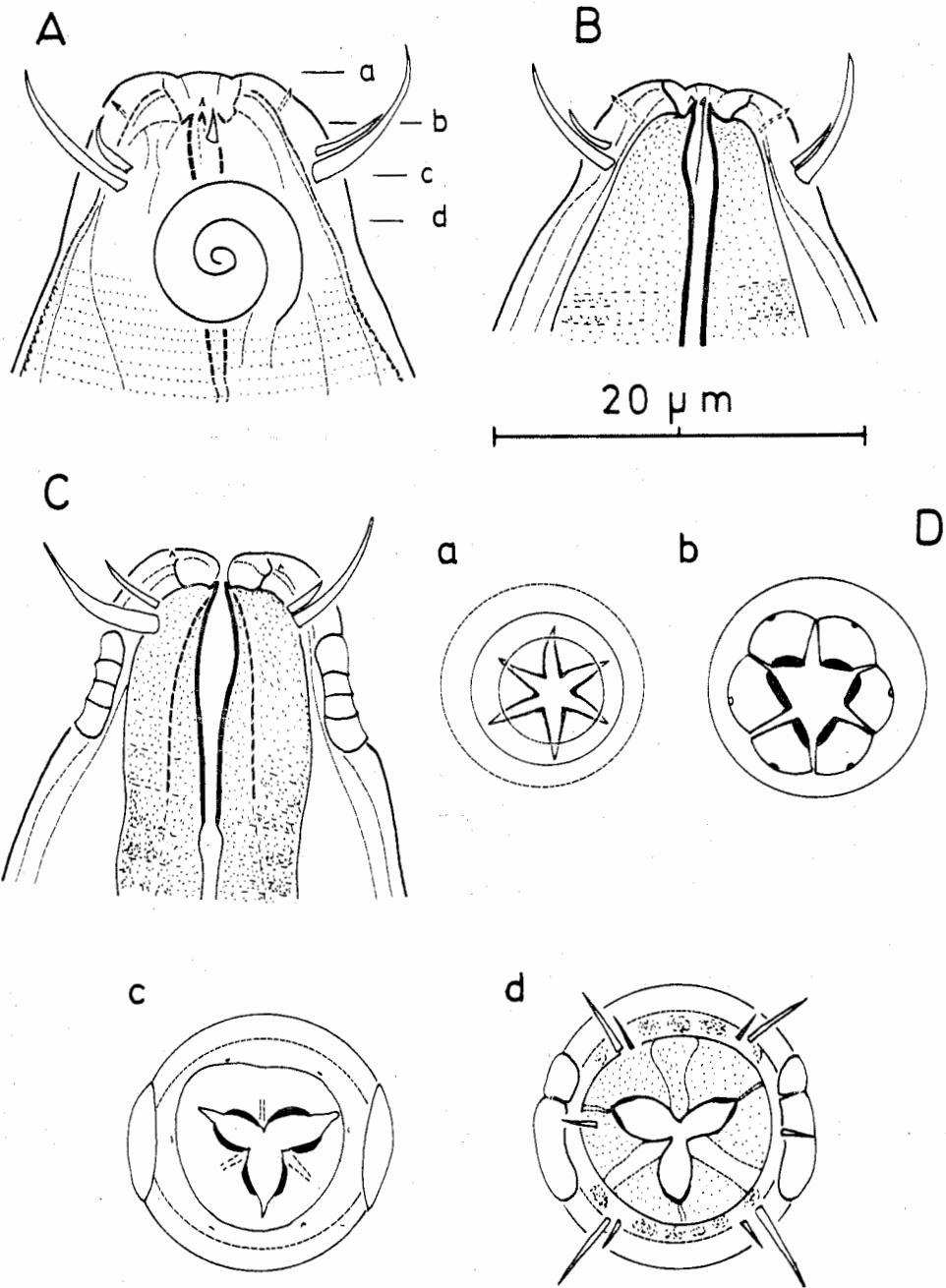


Fig. 3. *Paracomesoma dubium* (Filipjev). *A*, Surface view of lateral side of head (male) with indication of comparable levels (*a-d*) at which the sections were made from another male; *B*, head region in longitudinal optical section, lateral view (female); *C*, head region in longitudinal optical section, ventral side (female); *D*, (*a*) head in 'en face' view, (*b*) at level of anterior circle of internal labial papillae, (*c*) at base of stoma, and (*d*) at level of outer crown of anterior sense organs.

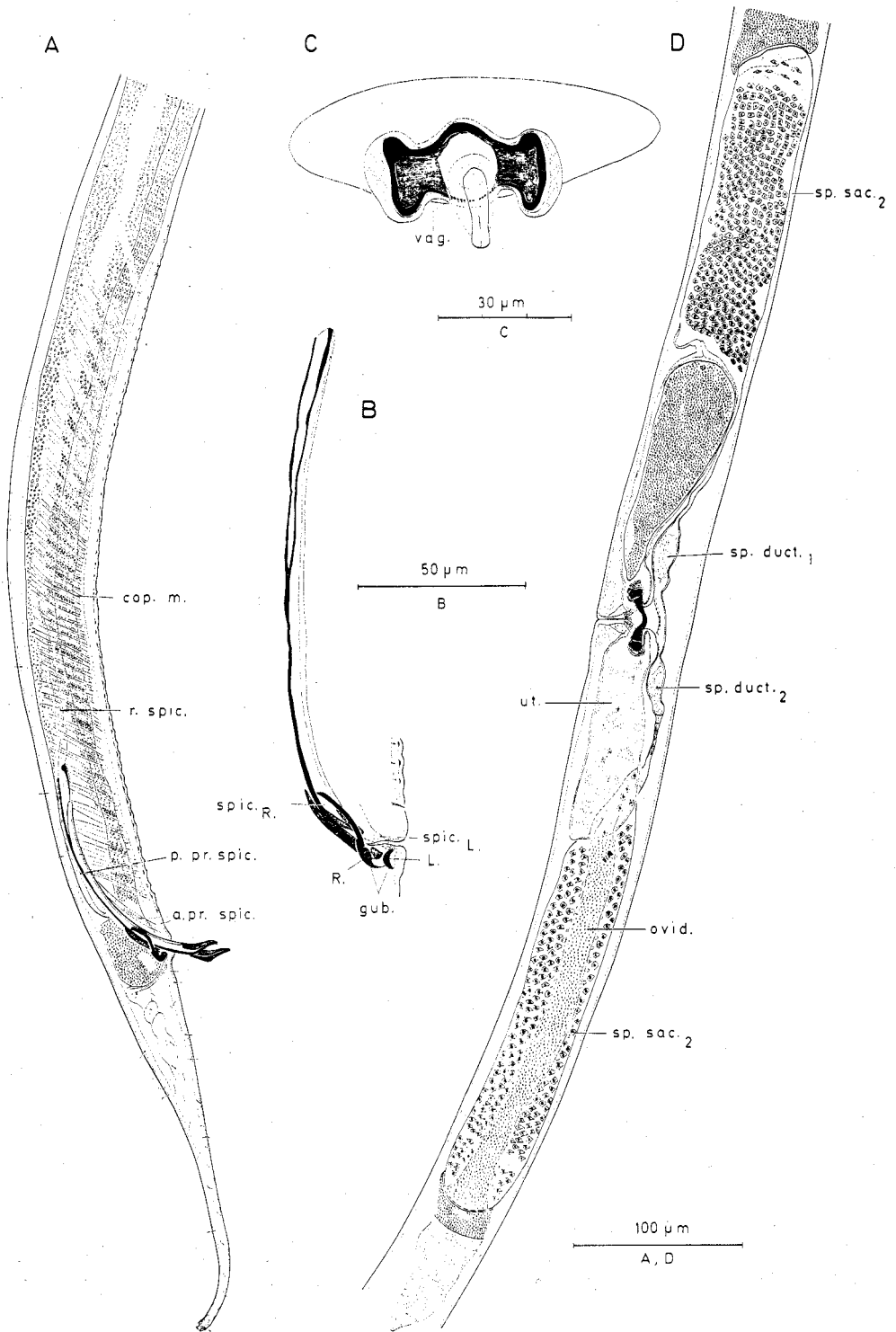


Fig. 4. *Paracomesoma dubium* (Filipjev). A, Posterior body region in male; B, male copulatory apparatus with distal portion of gubernaculum seen obliquely; C, vulva region in ventral view; D, female reproductive system (left side of body).

Measurements

<i>Males (n = 5)</i>		<i>Females (n = 5)</i>	
L	1860-2045	L	1900-2245
hd	12-14	hd	13-14
amph	8-9	amph	8-9
bd oes	44-49	bd oes	48-53
bd	47-56	bd vulva	57-64
a b d	41-42	a b d	37-41
oes	185-210	oes	185-235
ex p	125	ex p	125
spic	140-165	L vulva	835-980
gub	30-35	V	40-45%
t	200-230	t	235-295
Indices of de Man		Indices of de Man	
a	33-44	a	33-37
b	9.7-10.4	b	8.8-11.9
c	8.9-9.6	c	7.9-8.5

Description

Body long and slender, tapering anteriorly in oesophageal region and posteriorly in tail region. Cuticle very finely annulated, annulation hardly visible at mid-body. Only in the anterior body region the punctations which build up the annules are noticeable. Somatic setae in anterior body region small (4-5 μm) and scarce; in tail region somewhat longer (6.5-7.0 μm) and more numerous; near tail tip 2 terminal setae (7 μm long) can be observed.

Head anteriorly tapers towards a truncated end. Six lips surround the hexaradial oral opening. Labial walls strongly cuticularized; in 'en face' view the lips are seen as flaps (Fig. 3a). Each lip bears a small (internal labial) papilla. More posteriorly and outwards on the head a circle of 10 cephalic sense organs can be observed, consisting of 6 short slightly more anterior setae (4-5 μm long) and 4 longer posterior setae (9-10 μm long).

Amphids are multiple spiral structures with $2\frac{1}{2}$ -3 turns and are 8-9 μm in diameter, i.e. $\frac{1}{2}$ the corresponding body width. Their anterior border lies at 5 μm from anterior extremity.

Stoma shallow, with at its base 3 small teeth (Figs 3A, 3B, 3C). Oesophagus cylindrical, slightly widening posteriorly to the nerve ring which surrounds the oesophagus about halfway along its length. Nucleus of the dorsal oesophageal gland usually distinct.

A rather small excretory gland situated subventrally shortly behind the cardia region along the anterior part of the intestine. Its excretory canal with anterior ampulla ends by a narrow outlet just posterior to the nerve ring, i.e. at about 60% of the oesophageal length from the anterior extremity.

Cardia 15-20 μm long and consisting of a relatively large muscular part surrounded by a thin layer of intestinal tissue. It protrudes rather far into the intestinal lumen.

Male reproductive system with 2 testes, with the posterior one reflexed. Spicules long and slender flanged structures. At rest they are straight throughout the greatest part of their length and only slightly distally bent, but are more curved upon protraction (see Figs 4A, 4B). Gubernaculum a complex structure of which each part consists of 3 elements: (1) a narrow median rod-like part (25-31 μm long) tapered proximally and lying dorsocaudally along and parallel with the spicules and inter-

locked with (2) two short semicylindrical distal parts ($6\ \mu\text{m}$ long), and (3) two narrow slightly arcuate pieces ($24\ \mu\text{m}$ long) situated laterally along the outer side of the spicules, each joining the raised border of the corresponding short distal part.

Dorsocaudally from the copulatory apparatus lies a large glandular structure.

Copulatory muscles strongly developed. Muscles of the spicular apparatus consist of 2 protractors and 1 long retractor; muscles of gubernaculum obscure in the specimens studied, only a retractor muscle extending from the rod-like median part parallel with the spicules to the dorsal body wall was observed in some specimens.

Ventrally, about 60 narrow band-like pre-anal supplements are present. They extend over a distance of $370\text{--}440\ \mu\text{m}$ anterior to the cloacal opening.

Female reproductive system didelphic-amphidelphic. The ovaries may be outstretched or reflexed, and both types can occur within the same animal. In all specimens studied the anterior branch always lies to the right of the intestine, the posterior branch to the left. The female reproductive system is a rather complex structure. Two very large blind-ending spermathecae with numerous spermatozoa are present, each provided with a rather long narrow canal. Both canals join each other above the vagina and are there connected with the remainder of the system. Due to the presence of these large spermathecae, the oviducts are only occasionally observed. A conspicuous H-shaped sclerotized structure occurs in the proximal part of the vagina (Figs 4C, 4D). Both ends of this structure apparently guard the entrance to the uteri.

Tail slender, conical anteriorly, narrow and more or less cylindrical posteriorly with slightly swollen tip. It is shorter in the male than in the female, its length is $4.8\text{--}5.6$ times the anal body width in males and $5.9\text{--}7.4$ times that in females.

Locality and Habitat

Lizard Island, mangrove swamp A (samples 1 and 2).

Material Examined

Sample 1: 16 ♂, 4 ♀, 24 juveniles. Sample 2: 13 ♂, 11 ♀, 28 juveniles.

Actinonema longicaudatum (Steiner)

(Fig. 5)

Euchromadora longicaudata Steiner, 1918, pp. 14–16.

Actinonema longicaudatum Wieser, 1954, p. 200.

Measurements

	Males (n = 3)		Females (n = 3)
L	1065–1090	L	990–1080
hd	11–13	hd	11–12
amph	9–10	amph	10
bd	31–32	bd vulva	32–33
bd oes	27–28	bd oes	28
a b d	30	a b d	21–22
oes	158–164	oes	155–165
ex p	86–87	ex p	86–87
spic	28–30	L vulva	465–485
gub	34	V	43.5–44.5%
t	190	t	200–220
	Indices of de Man		Indices of de Man
a	33–35	a	30.0–33.5
b	6.5–6.9	b	6.3–6.5
c	5.6–5.8	c	4.6–5.2

Description

Body long and slender. Body cuticle very thick with similar ornamentation in both sexes. From the level of the amphids cuticular annules consist of heavy dots, without lateral differentiation during the anterior $\frac{1}{3}$ of oesophageal region. More posterior, cuticle shows a lateral differentiation, different according to the body region (Figs 5A, 5a-e), each body ring being subdivided into 2 partial rings (Fig. 5h).

Somatic setae short (4 μm) and scarce, situated in 4 longitudinal rows.

Head bears a circle of 6 internal labial papillae hardly visible as dots in lateral view and a circle of 10 very short cephalic setae with the 4 slightly outer setae hardly longer than the 6 external labial setae (Figs 5B, 5f: in 'en face' view). Head cuticle showing 6 large sclerotizations, triangular in lateral longitudinal optical view (Fig. 5B) with large dots between their bases and situated just anterior to the amphids. Amphids are conspicuous transverse slits with distinct contour, 9-10 μm wide, i.e. about 80% of the corresponding body width; they are situated far anteriorly on the head at about 3 μm from the anterior end.

Oral opening circular; cheilostome strengthened by 12 rugae (Figs 5C, 5f). Stoma rather shallow, 3-4 μm deep. At base of stoma an anteriorly pointed dorsal tooth and 2 very small ventrosublateral teeth are observed (Figs 5C, 5f-g).

Oesophagus narrow cylindrical, slightly wider behind the nerve ring and becoming clavate at its posterior end. Cardia region not clearly defined. Intestine rather thin-walled, cylindrical. Nucleated excretory gland cell lies along anterior intestinal region, reaching 40-55 μm posterior to the oesophago-intestinal junction. Fine excretory canal with slightly wider anterior ampulla ends by a fine outlet just posterior to the nerve ring, i.e. at about 85 μm from the anterior extremity.

Male reproductive system with only 1 testis continuing in a large vesicula seminalis, followed by a differentiated vas deferens with high columnar cells. Pre-anal supplements are lacking.

Spicules stout and well sclerotized; proximally they have a narrow capitulum mainly with parallel walls and marked off by a conspicuous enlargement of the corpus; distally they are tapered and slightly arcuated.

Muscular system of the spicular apparatus weakly developed; only an antero-dorsally orientated retractor muscle was observed.

Gubernaculum longer than the spicules, consisting of a median part with strongly sclerotized dorsal wall, a thickened knob-like proximal end (lying between the spicules) and provided with large lateral flanges surrounding the spicules. Distally, gubernaculum thinner and weakly sclerotized.

Muscular system of the gubernaculum strongly developed, consisting of (1) a narrow protractor muscle running from the knob-like proximal end of the gubernaculum towards the ventral body wall just posterior to the cloaca, (2) two sets of retractor muscles: a pair of large fan-shaped anterior retractors inserting on the proximal part of the lateral flanges of the gubernaculum and running anteriorly towards the lateral body wall, and a short fan-shaped posterior retractor inserting on the proximal end of the gubernaculum and extending towards the dorsal body wall, and (3) two sets of inclinators: a smaller muscle inserting dorsally on the gubernaculum in its proximal end and running slightly caudally towards the dorsal body wall, and a pair of very large fan-shaped inclinators inserting on the lateral flanges and running dorsocaudally towards the dorsal body wall.

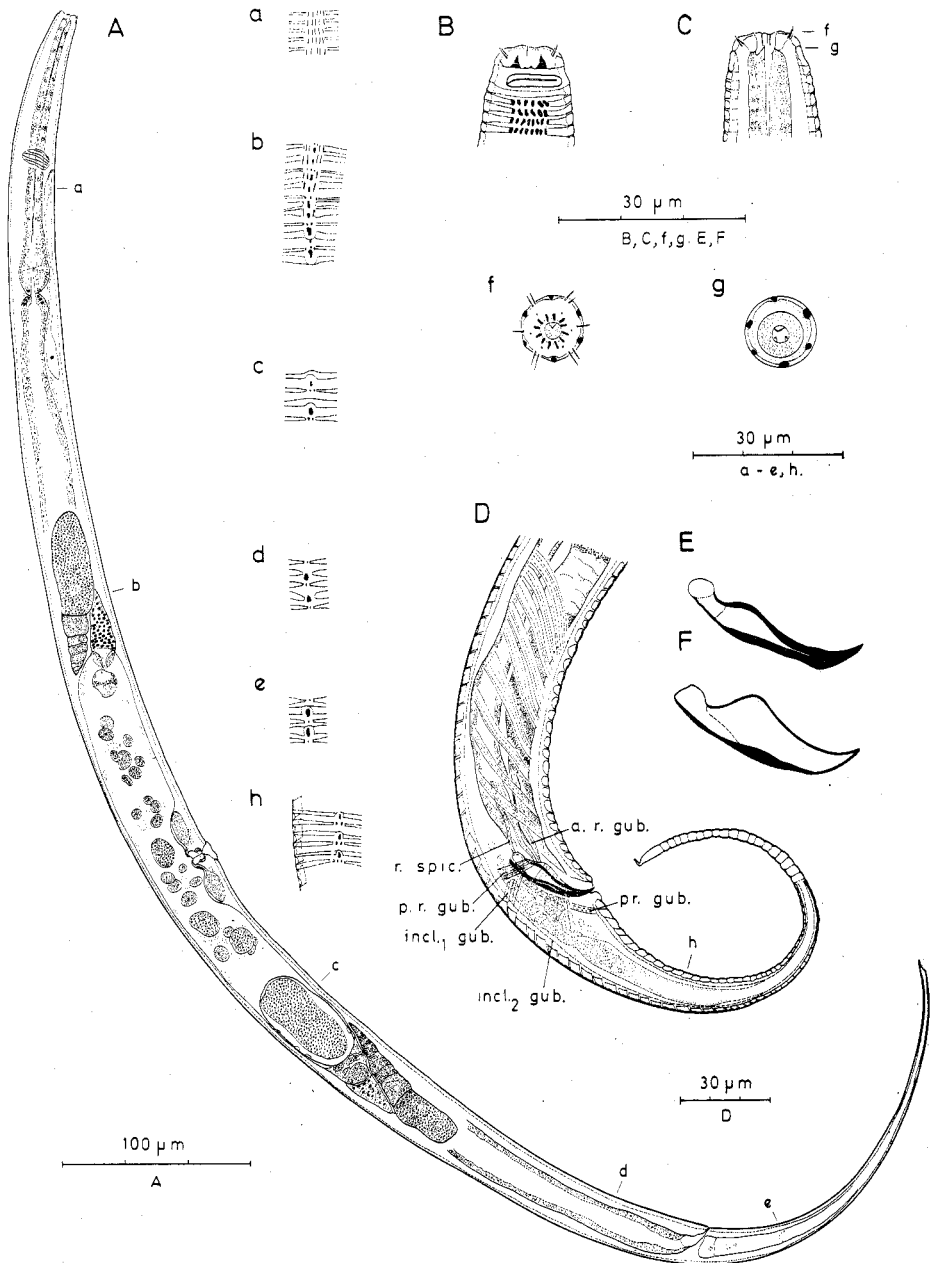


Fig. 5. *Actinonema longicaudatum* (Steiner). *A*, Total body of female in longitudinal optical section (lateral side) with indication (*a-e*) of the levels showing the lateral differentiations of the cuticle represented under *a-e*; *B*, surface view of head, lateral side (female); *C*, head region in longitudinal optical section (female) with indication of the levels (*f-g*) at which the sections were made from another specimen; (*f*) head in 'en face' view, and (*g*) at level of base of stoma; *D*, posterior body region in male with indication of the level (*h*) showing the lateral differentiation of the cuticle; *E*, spiculum; *F*, gubernaculum.

Female reproductive system didelphic-amphidelphic with reflexed ovaries. In the individuals studied the position of the ovaries relative to the intestine varied according to the individual; some specimens have both branches to the right of the intestine, others have the anterior branch to the right and the posterior branch to the left of the intestine. Two elongated, narrow sac-like glandular structures containing small rounded dark yellowish granules are present. They are connected with the corresponding uterus, but a connection between uterus and oviduct was not observed. In some specimens the uteri contain apart from a ripe ovum, 58 by 26–29 μm diameter, several small cellular structures (spermatozoa?) (Fig. 5A). Two vulval glands present, one on each side of the vagina.

Tail narrow, elongated. Its length is 9–10 times the anal body width in females and 6–7 times that in males.

Locality and Habitat

Lizard Island, mangrove swamp A (samples 1 and 2).

Material Examined

5 ♂, 16 ♀, 1 juvenile. 1 ♂ (NSIMB 534) deposited in Nematodensammlung des Instituts für Meeresforschung Bremerhaven.

Discussion

Until now *Actinonema longicaudatum* (Steiner, 1916) Wieser, 1954, was only poorly described, since Steiner (1916) based the description on only one female specimen. As pointed out by Inglis (1969) this description does not allow the species to be distinguished with certainty from other species of the genus. The few characteristics of some diagnostic value are the measurements and indices of de Man, especially the low *c*-value (3.8) compared with the other species of *Actinonema*.

Consequently there is, according to Inglis (1969), no justification for the synonymization by Wieser (1954) of *Pareuchromadora fragilis* Allgén, 1942, and *P. setifer* Schuurmans Stekhoven, 1943, with *A. longicaudatum*. The latter and *P. fragilis* Allgén, 1942 (also based on a single female specimen) are both considered as species dubia by Inglis, and *P. setifer* Schuurmans Stekhoven, 1943 (based on a single male without tail) as a species inquirenda; all three species are considered as belonging to *Actinonema*. However, apart from the tail character *P. setifer* shows many similarities with the Australian specimens and the copulatory apparatus is similar, hence *P. setifer* could indeed be identical with *A. longicaudatum*. Wieser (1959) also described male specimens, but did not give many details. Pending further information the status of *P. setifer* remains doubtful.

The Australian specimens largely agree with the descriptions of *A. longicaudatum* given in the literature. They differ, however, in the longer spicules (26–28 μm as against 18 μm in Wieser, 1959) and higher *c*-values (4.6–5.8 as against 3.3–4.7).

New observations given here concern (1) the typical arrangement of the anterior sense organs as in *A. pachydermatum* Cobb, 1920; (2) the complex structure of the copulatory apparatus and its muscles; and (3) the presence of 2 small ventrosublateral teeth such as in *A. pachydermatum*.

On the basis of the Australian specimens a close resemblance between *A. longicaudatum* and *A. pachydermatum* seems to exist. The main difference between both species lies in the longer tail and smaller *c*-value in *A. longicaudatum* [3.3–5.8 as against 6.5–7.6 in *A. pachydermatum* (see Lorenzen 1972)], in the cuticular ornamentation of the region showing a lateral differentiation, in the copulatory apparatus especially the shape of the gubernaculum with a knob-like proximal end in *A. longicaudatum*, absent in *A. pachydermatum*, and in the absence of a narrow cuticularized tube between both spicules and the gubernaculum as present in *A. pachydermatum*.

Ptycholaimellus lizardiensis, sp. nov.

(Fig. 6)

Measurements

Holotype ♀		Paratype ♀ (n = 1)		Paratype ♂ (n = 1)	
L	770	L	870	L	545
hd labial region	12	hd labial region	11	hd labial region	9
hd amph	17	hd amph	17	hd amph	17
c s	8	c s	8	c s	8
amph	15	amph	16	amph	16
oes	143	oes	160	oes	115
ex p	9.5	ex p	9	ex p	12.5
b d oes	39	bd oes	41	bd	26
a b d	21	a b d	25	bd oes	28
bd vulva	42	bd vulva	45	a b d	17
L vulva	360	L vulva	400	spic	20
V	46.7%	V	45.9%	gub	13
t	125	t	118	t	85
Indices of de Man		Indices of de Man		Indices of de Man	
a	18.3	a	19.3	a	19.5
b	5.4	b	5.4	b	4.7
c	6.2	c	7.4	c	6.4

Description

Body rather slender, tapering towards the extremities. Cuticular ornamentation homogeneous, consisting of transverse rows of punctations with lateral differentiation, beginning just posterior to the amphids. Punctations are somewhat coarser in anterior body region than on the rest of the body where they are relatively fine. Lateral differentiation 3.5–5.0 μ m wide consisting of bars flanked on both sides by a longitudinal row of larger dots, conspicuous in mid-oesophageal region. In filliform terminal part of tail, lateral differentiation becomes obscure and disappears. Outside the lateral differentiation a longitudinal row of small pores and short somatic setae, 3 μ m long, can be observed.

Labial region 9–12 μ m wide, offset from and slightly narrower than the rest of the head. Extreme anterior end bears (1) a circle of 6 minute inner papillae, in longitudinal optical view visible only as 6 dots situated near the mouth opening, and (2) a circle of 6 short outer papillae situated close to the outer head margin just anterior to the outer circle of 4 fine cephalic setae. Amphids, slit-like structures, 15–16 μ m wide, i.e. as wide as the corresponding head region and situated far anteriorly, opposite the base of the cheilostome.

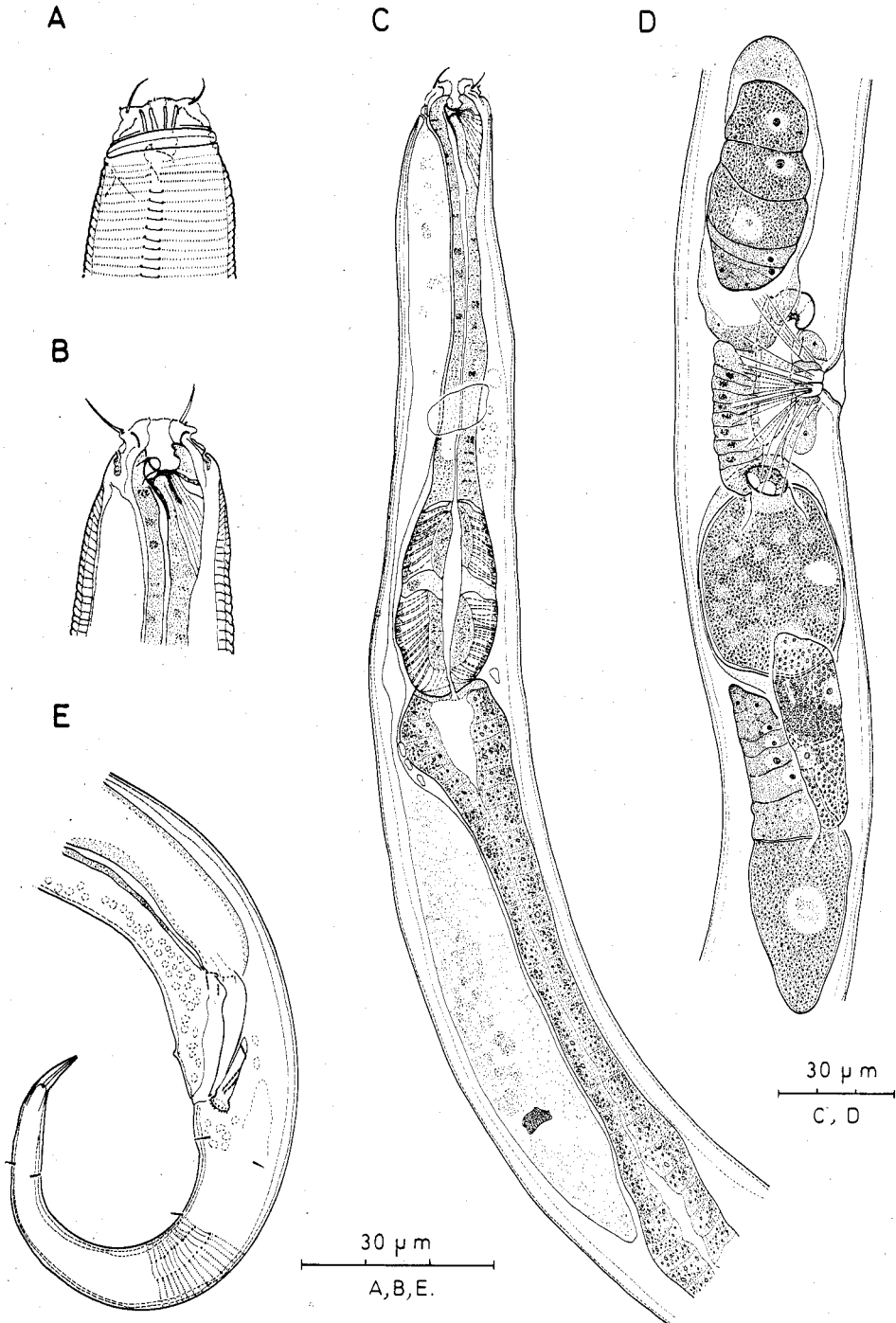


Fig. 6. *Ptycholaimellus lizardiensis*, sp. nov. *A*, Surface view of head region lateral side (♀, paratype); *B*, head region in longitudinal optical section (♀, holotype); *C*, anterior body region with oesophago-intestinal junction, lateral view (♀, paratype); *D*, female reproductive system (paratype); *E*, posterior body region in male, lateral view (paratype).

Stoma, 8–9 μm deep, consist of (1) an anterior cheilostomal part (5.0–5.5 μm long) with presumably 12 flanges projecting into the lumen, each flange strengthened by a cuticular tube-like structure, and (2) a wider basic part surrounded by oesophageal tissue and containing a prominent, hollow dorsal tooth with dorsal apophysis. Dorsal tooth flanked on both sides by a lateral flange from the stomatal wall (see Inglis 1969, fig. 59 of *Hypodontolaimus slacksmithi*). Opposite the large dorsal tooth the ventral wall of the basic stomatal region is somewhat irregularly cuticularized.

Oesophagus has a narrow cylindrical anterior part, ending posteriorly in a very prominent elongated bulb occupying 30.0–37.5% of the total length of the oesophagus. Bulb subdivided by a relatively large transverse interruption of the musculature (4.5–5.5 μm diameter) into 2 parts, with the anterior one usually slightly smaller than the posterior one. Nerve ring surrounds the oesophagus about halfway along its length. No distinct cardia present; oesophago-intestinal junction only 1.5 μm long. Intestine anteriorly compressed by the enormously developed excretory gland which extends 102–148 μm posterior to the oesophago-intestinal junction. Intestinal wall composed of relatively high polygonal cells with few large granules. Rectum narrow (21 μm long in females), separated from the intestine by a clear sphincter. In one of the females the terminal part of the intestine is laterally flanked by an elongated, nucleated glandular structure.

Large excretory gland situated ventrally along anterior part of intestine; opening far anteriorly to the exterior (9.0–9.5 μm in females, 12.5 μm in the male from the anterior extremity), i.e. just posterior to the level of the amphids. Large excretory duct swollen all along the cylindrical oesophageal region.

Male reproductive system with 2 testes, the posterior one being totally reflexed. The male specimen available is a young individual with the genital system completely formed but still little developed.

Spicules weakly sclerotized. They are nearly straight with a narrower, slightly offset capitulum; corpus tapered distally. Muscles of spicular apparatus obscure.

Gubernaculum consists of (1) a median part (8 μm long), possessing a fine anteriorly bent proximal end and mainly parallel with the spicules, and (2) two lateral pieces, each with a widened and outwardly orientated distal end with a strongly dentated edge (about 10 fine denticles present) and a 2nd row of denticles.

One small pre-anal papilla can be observed some 7 μm anterior to the cloacal opening.

Female reproductive system didelphic-amphidelphic with reflexed ovaries. In the specimens studied the anterior branch was situated to the right of the intestine, and the posterior branch to the left. The oviduct is a thin-walled tube masked by the presence of a large, elongated sac-like glandular structure lying adjacent to the oviduct. This gland contains 3 nuclei; the nuclei are large and have a distinct nucleolus; the cytoplasm of the gland contains numerous large, dark yellowish granules. Connection between oviduct and uterus rather obscure. In one of the specimens studied the uterus in the posterior branch contains an egg (50 by 37 μm) with a relatively thick, smooth shell. In both branches the uterus is separated from a common uterine sac (ovejector), opposite the vagina, by a strongly developed refractive constriction. Roof of ovejector composed of 2 rows of columnar cells (Fig. 6D); the cells of the bottom are low. Vagina well cuticularized. Musculature of vagina consists of a refractive constrictor vaginae composed of 2 semicircular

parts and probably 12 bands of radiating muscles inserting on the vulva lips and running towards the body walls near the lateral chords. Vagina flanked on both sides by a small vaginal gland. Spermatozoids not observed. No separate spermathecae present. Vulva forms a deep depression.

Tail slender, ventrally bent and posteriorly tapering towards a sharp to a fine spinneret (6.0–7.5 μm long).

Type Locality and Habitat

Lizard Island, mangrove swamp A (sample 3).

Other Localities and Habitat

Lizard Island, mangrove swamp A (sample 1); Lizard Island, mangrove swamp B (samples 4 and 8).

Type Material

Holotype ♀, No. 204. Paratypes: 3 ♀, Nos A5708, A5712, A5606; 1 ♂, No. A5671. Five juveniles, Nos A5622, A5627, A5654, A5709. 3 ♀, 1 juvenile, 1 ♀ (G 11606) deposited in the Queensland Museum.

Diagnosis

Ptycholaimellus lizardiensis, sp. nov., can be distinguished from all known species of the genus by the shape of the gubernaculum which consists of a small median part and 2 lateral pieces with strongly dentated and enlarged distal ends; by the presence of a small pre-anal papilla (absent in the other species); by the presence of a very large amphid about as wide as the corresponding body width; and by the far anterior position of the excretory pore, i.e. just posterior to the amphids. In females *P. lizardiensis*, sp. nov., is also characterized by possessing a large refractive constriction between the uteri and the ovejector. However, by the lack of detailed morphological studies, for example of the reproductive system, we cannot be certain about the diagnostic value of the latter characteristic.

The new species is named after the locality, Lizard Island.

Remarks

The structure of the female reproductive system observed in *P. lizardiensis*, sp. nov., largely agrees with the structure of the female genital apparatus in females of several species belonging to the Chromadoridae, e.g. *Hypodontolaimus inaequalis* (Bastian, 1865) de Man, 1886 (P. Lippens, unpublished data).

It has been observed on several occasions that the copulatory apparatus in young males is not yet completely developed. This should be taken into account later on when older males are found. The structure of the gubernaculum seems, nevertheless, sufficiently differentiated to characterize the species.

Paracanthonchus parahartogi, sp. nov.

(Fig. 7)

Measurements

<i>Holotype</i> ♂		<i>Paratype</i> ♂ (<i>n</i> = 2)		<i>Paratype</i> ♀ (<i>n</i> = 3)	
L	1440	L	1350-1405	L	1410-1560
hd	29	hd	27-28	hd	29-33
amph	11	amph	12	amph	8
oes	220	oes	220-230	oes	220-235
ex p	53	ex p	60	ex p	60
bd	80	bd	67-73	bd oes	61-72
bd oes	65	bd oes	59-60	bd vulva	73-99
a b d	53	a b d	49-56	a b d	44-52
spic	52	spic	49	L vulva	685-750
gub	53	gub	50	V	48-50%
t	142	t	120-130	t	125-145
<i>Indices of de Man</i>		<i>Indices of de Man</i>		<i>Indices of de Man</i>	
<i>a</i>	18.0	<i>a</i>	19.0-20.0	<i>a</i>	15.5-19.5
<i>b</i>	6.5	<i>b</i>	6.1-6.3	<i>b</i>	6.3-6.6
<i>c</i>	10.1	<i>c</i>	10.5-11.5	<i>c</i>	10.8-11.3

Description

Cuticle marked by fine regular punctations with a lateral differentiation consisting of a coarser and more dispersed punctation, the latter more pronounced in the posterior part of the body where a transverse row of dots alternately disappears in the lateral field. Body bears a number of short setae and rows of pores situated as follows. Lateral field bordered at each site by a longitudinal row of numerous pores with a refractive cuticularized border sometimes showing a small projection in the middle and connected with 2 rows of large glandular cells. In the middle of the lateral field a series of somewhat smaller pores, less numerous and with a less cuticularized border. Outside the row of pores limiting each side of the lateral field occurs a longitudinal row of short setae, less numerous in number than the pores. In the dorsal sector, as well as in the ventral sector presumably, another 3 longitudinal rows of pores in connection with glandular cells can be observed. Males possess an additional longitudinal row of setae situated subventrally on each side of the body, from shortly anterior to the pre-anal supplements. Those setae, at first very short (3 μ m), are longer (9-13 μ m) in the area in between the large supplements and become short (3 μ m) again opposite the 2 small supplements. Posteriorly to the cloaca 2 elongated setae (9-11 μ m) are situated subventrally on both sides of the body.

Head typical, with an inner circle of 6 minute labial papillae and an outer circle of 10 very short setose sense organs of which the 6 labial ones are shorter than the 4 cephalic ones; all 10 setae are difficult to observe. Amphids spiral, with $3\frac{3}{4}$ turns, situated just posterior to the stoma and are somewhat smaller in females than in males.

Oral opening triangular, surrounded by 6 lips; cheilostome strengthened by 12 rugae. Stoma 11 μ m deep; a very small dorsal tooth is present.

Oesophagus more or less cylindrical, slightly expanded posteriorly to the nerve ring, which surrounds the oesophagus halfway along its length. Relatively large excretory gland with distinct nucleus and nucleolus is situated lateroventrally along

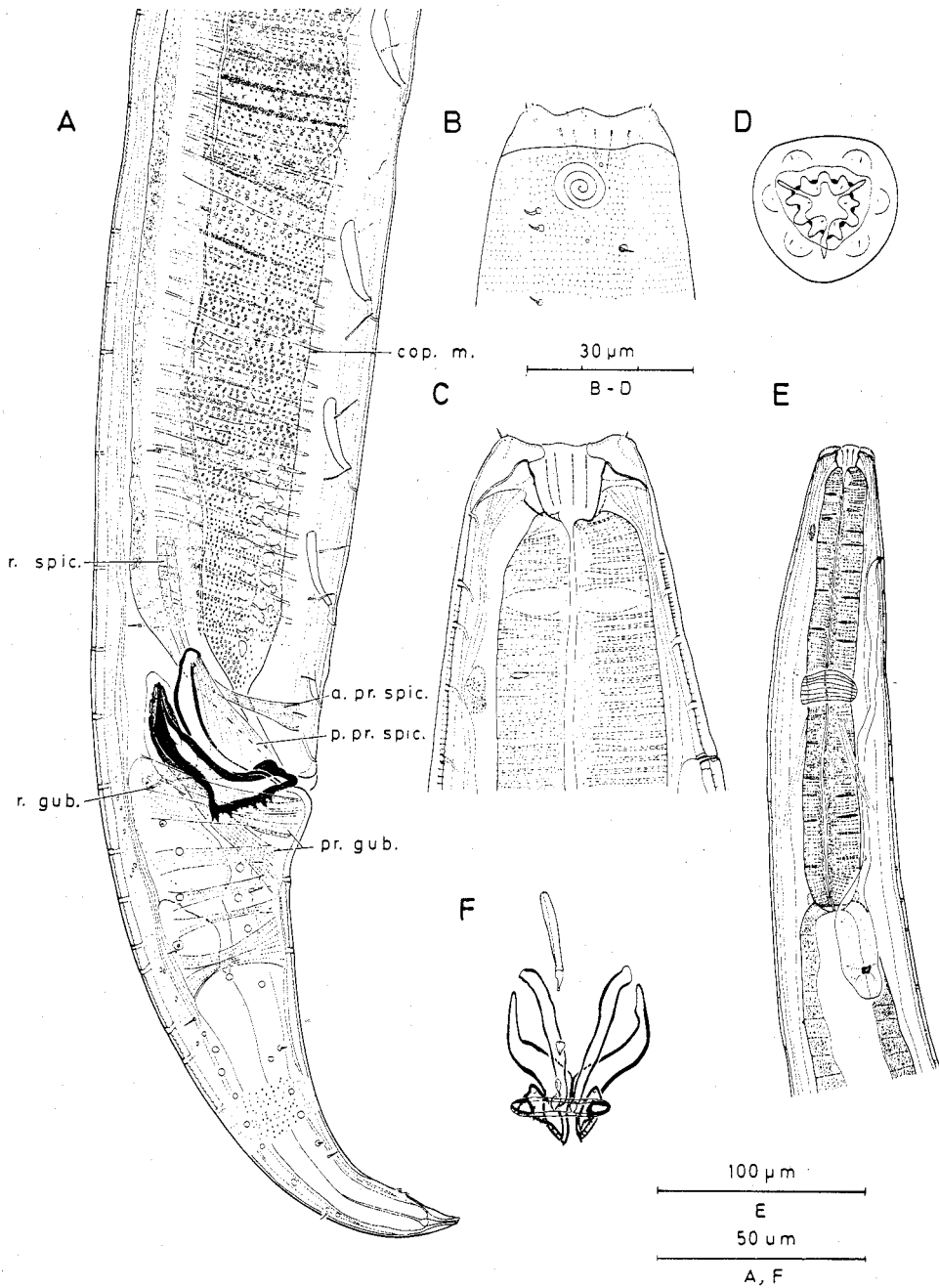


Fig. 7. *Paracanthonus parahartogi*, sp. nov. *A*, Posterior body region in male, lateral view (holotype); *B*, surface view of head region, lateral side (female); *C*, anterior body region in longitudinal optical section (female); *D*, head in 'en face' view; *E*, anterior body region with oesophago-intestinal junction, lateral view (δ , holotype); *F*, male copulatory apparatus, two phasmids and one pre-anal papilla in ventral view (holotype).

the anterior part of the intestine. Excretory duct ends rather far anteriorly, at 53–60 μm from the extreme anterior body end, near a small ampulla and a refractive, cuticularized outlet.

Cardia very short (5 μm long) and more or less triangular in longitudinal optical section. Intestine broad and cylindrical with a wide lumen.

Laterodorsally on both sides of the body just anterior to the level of the excretory pore lies an ocellus consisting of a small anterior obscure lens-like unit and a small group of fine dark yellowish granules.

Male reproductive system consists of 2 testes (one completely posteriorly reflexed) ending in a common part or vesicula seminalis which continues in the vas deferens. The latter is differentiated according to its physiological condition, its wall consisting of polygonal cells.

Spicules (49–52 μm long) arcuated, showing a strongly bent fine distal part with an open tip and proximally a demarcated capitulum. Each spiculum provided with a bifurcated retractor muscle and 2 protractors: an anterior protractor muscle extending from the capitulum of the spiculum towards the ventral body wall, and a fan-shaped posterior protractor running from the capitulum to the broad distal part of the gubernaculum (Fig. 7A).

Gubernaculum (52–53 μm long) L-shaped in lateral view and consisting of 2 wide dentated distal parts with a raised tip (26 μm wide); each part continues in a finer anterodorsally orientated apophysis with narrow proximal end. Massive distal portion of the gubernaculum is provided with 6 larger and several smaller spines. Muscular system of gubernaculum consists of (1) a protractor allowing at each side protraction and inclination of the gubernaculum, and (2) a retractor extending from the distal part of the gubernaculum towards the dorsal body wall.

Six pre-anal tube-like supplements present: 4 anterior prominent ones (24–25 μm long) with a well sclerotized wall and a fine strongly bent outlet (6 μm long), and 2 smaller supplements (called cloacids by Inglis 1970), only 8.5 μm long, with a weaker cuticularized wall and situated just anterior to the cloacal opening. Six pre-anal supplements situated respectively at 170, 116, 72, 41, 18 and 5.5 μm from the cloacal opening. Copulatory muscles well developed, extending to the level of the junction of the testes with the vesicula seminalis.

Female reproductive system opposed and reflexed. In the specimens studied the anterior branch is situated to the right of the intestine, and the posterior branch to the left. In each branch the oviduct apparently ends halfway in the spermatheca which is also connected with the uterus. Lining of vagina cuticularized.

Tail relatively stout, ventrally bent and in males provided with 2 pairs of minute tube-like structures near the tail tip.

Type Locality and Habitat

Lizard Island, mangrove swamp A (sample 3).

Type Material

Holotype ♂, No. 206. Paratypes: 2 ♂, No. A5660; 2 ♀, Nos A5660, A5718, A5719. 21 juveniles, five are numbered A5585, A5607, A5627, A5633, A5705. 1 ♀ paratype (G 11607) deposited in the Queensland Museum.

Diagnosis

Paracanthonchus parahartogi, sp. nov., is characterized by possessing, apart from an inner circle of 6 minute labial papillae, an outer circle with 10 very short setose sense organs; by the relative large spiral amphids with $3\frac{3}{4}$ turns; by having only 1 very small dorsal tooth; by the shape of the copulatory apparatus: spicules with a fine, arcuate distal part and a bipartite gubernaculum with broad, spiny distal parts; and by the presence of 6 pre-anal supplements: 4 prominent anterior ones and 2 small cloacids.

Discussion

The Australian specimens described are closely related to *P. hartogi* Inglis, 1970, in general habitus, in the shape of the copulatory apparatus, in the number and shape of the pre-anal supplements, and in the shape and position of the amphids. They differ, however, from *P. hartogi* in the following characters:

- (1) The cuticle has fine punctations and lateral differentiation instead of having a fine striation without lateral differentiation as in *P. hartogi*.
- (2) The length and location of the outer circle of anterior sense organs on the head region is very short and far anteriorly inserted in the new species as against longer and more posteriorly inserted setae in *P. hartogi*.
- (3) The large distal part of the gubernaculum is provided with 6 large and several small spines instead of only 4 large ones as in *P. hartogi*.
- (4) The spicules have a fine, arcuate distal part and are without flanges in the new species instead of having a narrow flange and straight end as in *P. hartogi*.
- (5) The cloacids are without projecting arrow-head-like processes as in *P. hartogi*.
- (6) The dorsal tooth is minute in the new species.

Paracanthonchus parahartogi, sp. nov., also resembles *P. stekhoveni* Wieser, 1954, *P. sunesoni* (Allgén, 1942) Wieser, 1954, *P. nannodontus* (Schulz, 1932) Wieser, 1954, and *P. macrodon* (Ditlevsen, 1918) Micoletzky, 1924, mainly in possessing a more or less pronounced L-shaped gubernaculum in lateral view with a large, spiny distal part. It further resembles *P. stekhoveni* in the structure of the body cuticle, in the presence of pre-anal subventral setae and 2 pairs of subventral setae on the tail, in the position of the excretory pore, and in the possession of 4 large tubular pre-anal supplements; it differs, however, from *P. stekhoveni* in the length of the cephalic setae (longer in *P. stekhoveni*), in the larger amphids with $3\frac{3}{4}$ turns instead of $4\frac{1}{2}$ turns as in *P. stekhoveni*, and in the presence of 2 fine cloacids instead of 1 as in *P. stekhoveni*.

The new species and *P. sunesoni* possess a similar pattern of the body cuticle, the same number and shape of the pre-anal supplements, 2 pairs of subventral setae on the tail region, and ocelli at comparable positions. The new species can be distinguished from *P. sunesoni* by the shape of the anterior sense organs (stout in *P. sunesoni*), by the shape and position of the amphids ($2\frac{1}{2}$ turns and located more posteriorly in *P. sunesoni*), and by the possession of only 1 minute dorsal tooth instead of 1 dorsal and 2 ventrosublateral ones in *P. sunesoni*.

In *P. macrodon* the gubernaculum was described as being mainly double, showing only a small common part situated between the spicules. In the new species the gubernaculum is entirely double, and no single common part was observed. The new species differs from *P. macrodon*, *inter alia*, in possessing only 1 minute dorsal

tooth instead of a medium-sized dorsal tooth and at least 2 small subventral teeth, in having an outer crown of 10 minute setose anterior sense organs on the head instead of longer setae as in *P. macrodon*.

The new species differs from *P. nannodontus*, *inter alia*, by the pronounced L-shape of the gubernaculum, by the shorter anterior sense organs, by the more posterior position of the excretory pore (i.e. 53–60 μm from the anterior body end as against 30–35 μm in *P. nannodontus*), and in males in the shape of the pre-anal supplements.

Halichoanolaimus quattuordecimpapillata Chitwood

(Fig. 8)

Halichoanolaimus quattuordecimpapillata Chitwood, 1951, p. 639.

Measurements

Male (n = 1)		Females (n = 3)		Juvenile (n = 1)	
L	2370	L	2270–2780	L	635
hd	47	hd	52–56	hd	15
c s	5	c s	5	c s	3.5
amph	14	amph	14	amph	7
oes	295	oes	305–330	oes	140
ex p	150	ex p	160–170	ex p	88
bd	94	bd oes	78–81	bd oes	31
bd oes	72	bd vulva	83–100	a b d	27
a b d	67	a b d	50–58	t	105
spic	82	L vulva	1120–1230		
gub	44	V	44–49.5%		
t	280	t	235–305		

Indices of de Man		Indices of de Man		Indices of de Man	
a	25.0	a	27.0–28.0	a	20.5
b	8.1	b	7.4–8.5	b	4.5
c	8.4	c	9.1–10.8	c	5.0

Description

Body stout and ventrally curved. In adults and juveniles cuticle marked by fine regular punctations with lateral differentiation consisting of coarser and more widely separated dots with radiating extensions. Lateral differentiation of body cuticle becomes distinct behind the amphids. Posterior to the demarcated cephalic region with smooth cuticle and in front of the amphids a small region is present showing a finely punctated cuticle with only a slight lateral differentiation consisting of fine, somewhat irregularly dispersed dots. Somatic setae very short and arranged in presumably 8 longitudinal rows. No body pores observed.

Head typical, bearing an inner circle of 6 small papillae situated on the lips and an outer circle of 10 cephalic sense organs of which 6 are small papillae and 4 are fine setae, 5 μm long in adults (Fig. 8a). Lips thick-walled, extending relatively deep into the stoma (Fig. 8B). Each lip possesses 2 arcuated structures running outwardly and posteriorly, which are separated from each other by the prominent nerve canal leading to the inner labial papilla. The arcuated structures serve, at the level of the outer circle of anterior sense organs, as insertion places for the labial muscles (Figs 8B, 8a).

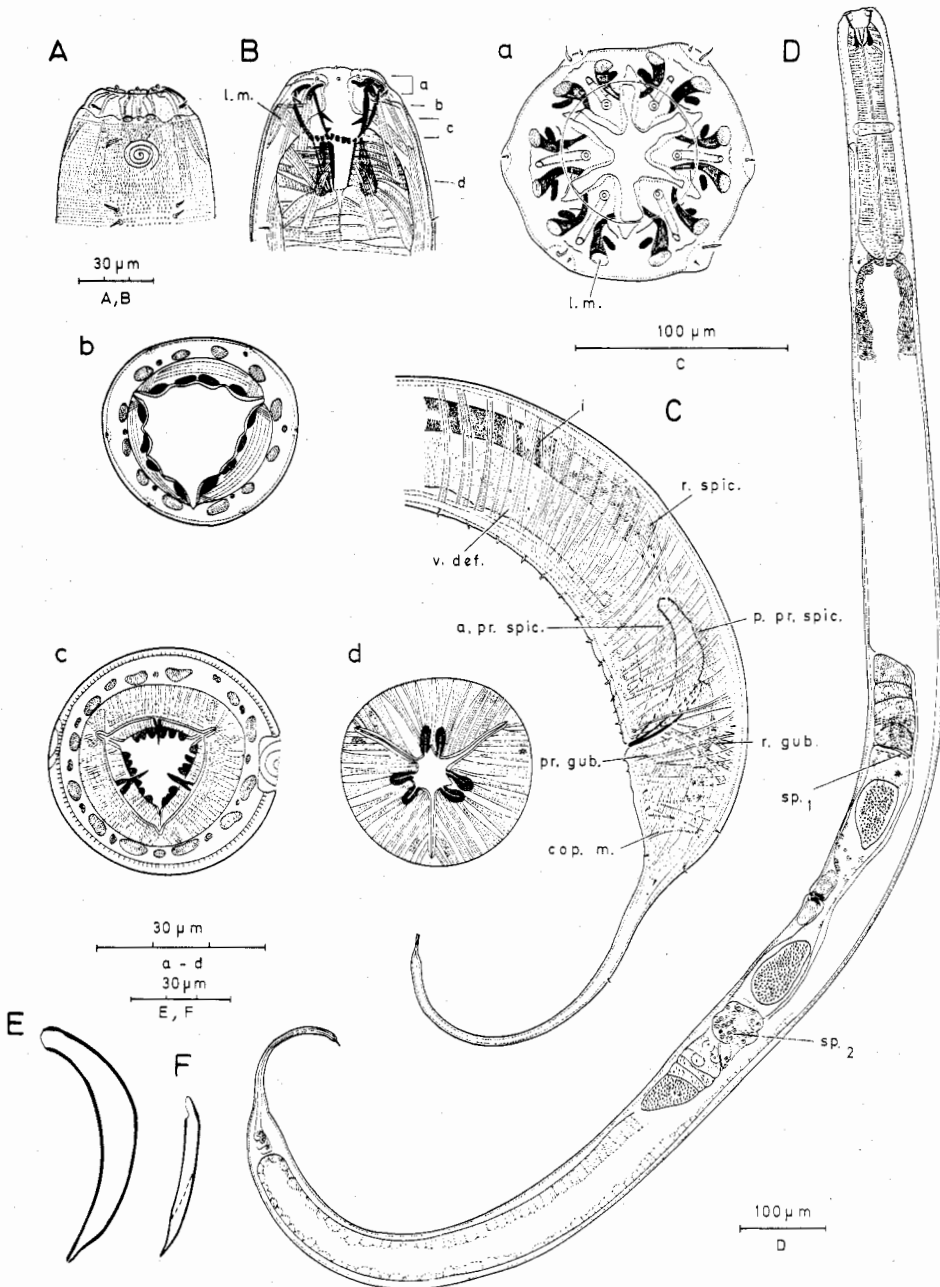


Fig. 8. *Halichoanolaimus quattuordecimpapillata* Chitwood. *A*, Surface view of head region, lateral side (female); *B*, head region in longitudinal optical section (female) with indication of comparable levels (*a-d*) at which the optical sections were made from another individual; (*a*) head in 'en face' view, (*b*) at level of anterior part of stoma with rugae, (*c*) at level of denticles and three fine hollow teeth, and (*d*) at level of anterior oesophageal region with apophyses; *C*, posterior body region in male, lateral view; *D*, total body of female in longitudinal optical section; *E*, spiculum; *F*, gubernaculum.

Amphids are multiple spiral structures with 4 turns and are 14 μm in diameter, i.e. 26% of the corresponding body diameter.

Buccal cavity with complex structure consists of 2 parts: a large anterior part (19 μm deep in one female) separated from a narrower posterior part (17 μm deep in one female) by a transverse zone of 18 denticles (6 per sector and 4.5 μm long) and provided with a median groove giving the impression of 2 rows of denticles at a certain level. Large anterior stomatal part with wide triangular lumen strengthened by 12 rugae (Figs 8B, 8b). In its basal region, just anterior to the denticles, 3 fine hollow teeth directed into the lumen are observed (Figs 8B, 8c). Wall of anterior stomatal part muscular and consisting, apart from marginal muscles, of fine muscle fibres running more or less parallel to the lumen wall (Figs 8b, 8c).

The oesophagus proper with a strongly muscular anterior part begins at the level of the denticles. Its lumen is narrower, triradial, and with a cuticularized wall. In lateral longitudinal optical section this anterior region contains 3 posterior apophyses (see Wieser and Hopper 1967, p. 269). In transverse optical section the 3 apophyses appear each to be formed by 2 adjacent strongly cuticularized projections of the inner oesophageal lining in each sector (Fig. 8d). At their posterior end the 2 projections of each sector apparently join each other, forming 1 knob-like posterior end or apophysis per sector. The muscular system in the stomatal region is so complex that a separate detailed study is needed to unravel its morphological structure.

Oesophagus largely cylindrical with anteriorly a prominent strongly muscular enlargement and slightly widened posteriorly. It is surrounded by the nerve ring at the end of the anterior half. Nucleus of dorsal oesophageal gland clearly visible close to the posterior end of the oesophagus.

Cardia a small, narrow structure protruding into the intestinal lumen.

Intestine composed of large polygonal cells provided with numerous, dark brownish granules especially in the anterior half of the intestine. In both sexes intestine ending blindly. In females the anus is lacking; in males a genital opening is present. However, in a juvenile specimen of presumably the 1st stage a very fine rectum and a small anus are present. A small excretory gland is situated ventrally at the level of the cardia. The excretory duct with large anterior ampulla ends by a fine cuticularized outlet just posterior to the nerve ring, i.e. at 150 μm from the anterior extremity in the male specimen studied.

Male reproductive system consists of 2 testes, with the posterior one completely reflected.

Spicules arcuated with an open distal tip (see fig. 33C in Wieser and Hopper 1967, p. 324). Muscles of the spicular apparatus strongly developed, consisting per spiculum of a bifurcated retractor and 2 protractors: an anterior protractor extending from the capitulum of the spiculum to the ventral body wall just anterior to the cloacal opening, and a fan-shaped posterior protractor running dorsally and laterally alongside the spiculum from the capitulum to the proximal end of the gubernaculum.

Gubernaculum provided with well developed muscles. It consists of a large fan-shaped protractor, extending from the proximal part of the gubernaculum to the ventral body wall between the posterior lip of the cloacal opening and the slight depression in front of the filliform portion of the tail; and a set of forked retractor muscles inserted about halfway on the dorsocaudal wall of the gubernaculum and running obliquely posterior towards the dorsal body wall.

Fourteen small pre-anal papilloid supplements present in the specimen studied. Copulatory muscles strongly developed, each muscle having a distinct nucleus.

Female reproductive system didelphic-amphidelphic, with reflexed ovaries. The anterior branch is partly situated to the left of the intestine, the posterior branch partly to the right.

Two spermathecae present. Vulva situated at 44.0–49.5% from the anterior end. Two vulval glands are well developed. Wall of vagina partly sclerotized.

Tail broad anteriorly, but soon narrowing suddenly to become filliform. Lateral differentiation of body cuticle ending at the beginning of the filliform part, in the latter part cuticle finely punctated.

Locality and Habitat

Lizard Island, mangrove swamp A (samples 1, 2 and 3).

Material Examined

1 ♂, 3 ♀, 6 juveniles.

Remarks

The absence of a rectum and anus in the adult Australian specimens of *Halichonolaimus quattuordecimpapillata* is remarkable. This phenomenon is especially distinct in females; it was not mentioned by Gerlach (1957, p. 142) nor by Wieser and Hopper (1967, p. 269).

Bathylaimus australis Cobb

(Fig. 9)

Bathylaimus australis Cobb, 1894, pp. 409–10.

To add to previous descriptions of *B. australis* a more detailed morphological study of the head was made, based on transverse optical sections of Australian specimens.

Measurements

<i>Males</i> (n = 4)		<i>Females</i> (n = 2)	
L	1230–1695	L	1240–1390
hd	22	hd	22
oes	250–290	oes	290
bd	40–52	bd oes	41–44
bd oes	40–47	bd vulva	41–44
a b d	30–33	a b d	26–28
spic	40	L vulva	610–670
t	95–105	V	48–49%
		t	95–97
Indices of de Man		Indices of de Man	
a	33.0–42.0	a	30.0–32.0
b	4.9–6.0	b	4.3–4.8
c	12.9–16.5	c	13.1–14.3

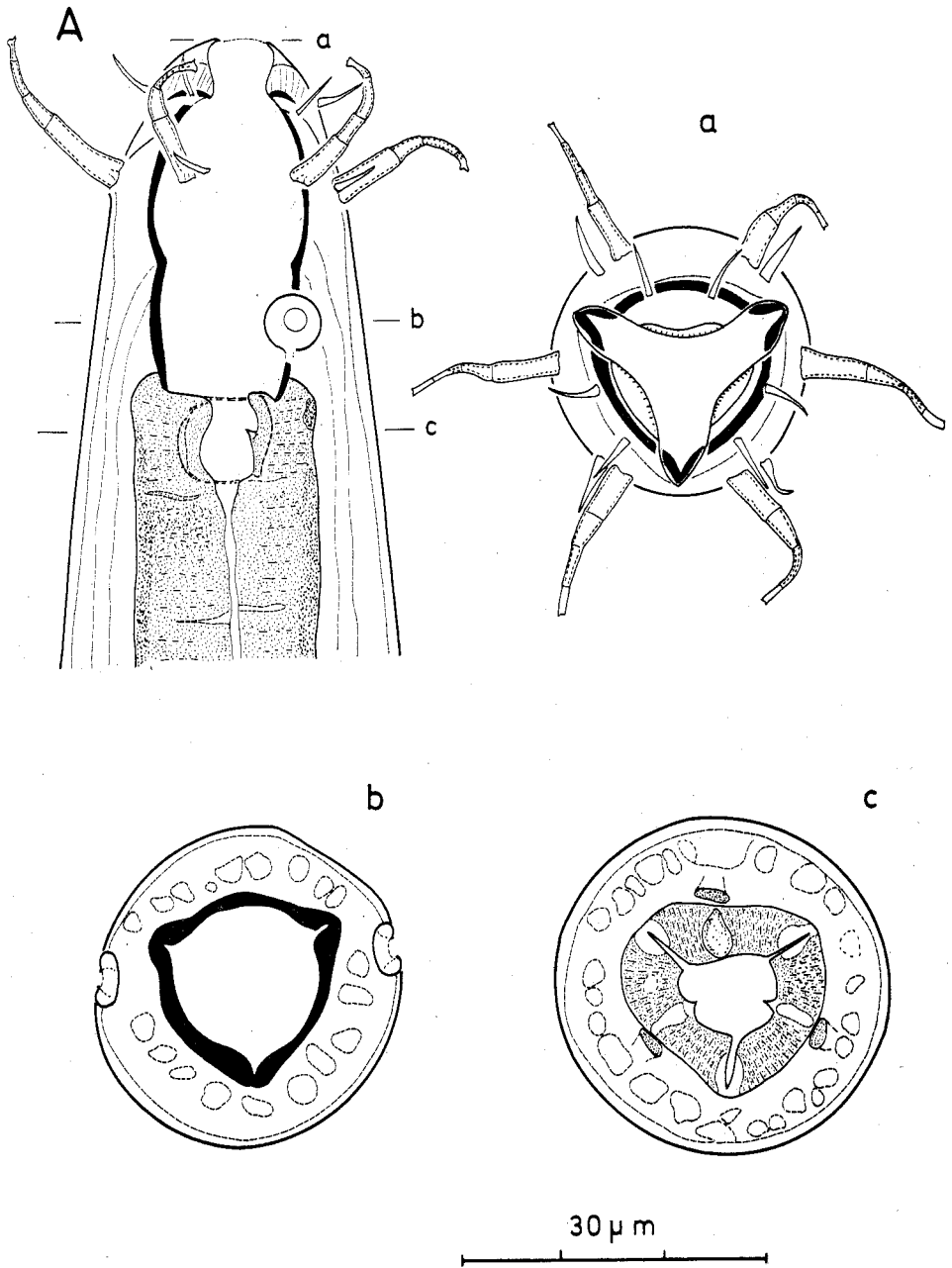


Fig. 9. *Bathylaimus australis* Cobb. A, Head region in longitudinal optical section (male) with indication of comparable levels (a-c) at which the optical sections were made from another specimen; (a) head in 'en face' view, (b) at level of the amphids, and (c) at level of two small ventro-sublateral teeth.

Description of Head Region

Head rounded anteriorly and possessing 3 large lips. Cephalic sense organs consist of first a circle of 6 small setae (5.5–6.5 μm long); then a circle of 10 composed of 6 long 'jointed' external labial setae with bifid tip (20–23 μm long) and 4 short cephalic setae (9–12 μm long) (Figs 9A, 9a).

Oral opening large and triangular leading into a wide and deep stoma (42 μm long). Buccal cavity subdivided into a large, wide anterior part (32–33 μm long) and a short narrower posterior part (9–10 μm long). Anterior stomatal region triangular in cross section, having a thickened, strongly cuticularized wall, showing at about halfway along its length a slight constriction. Posterior stomatal region also triradial but its wall non-thickened and weakly cuticularized, bearing 2 small ventro-sublateral teeth; it is completely surrounded by oesophageal tissue (Fig. 9c).

Locality and Habitat

Lizard Island, mangrove swamp A (samples 1 and 2).

Material Examined

8 ♂, 6 ♀, 12 juveniles.

Remarks

All descriptions of specimens of *B. australis* Cobb, 1894, lack data on the presence of ventrosublateral teeth. However, all descriptions of specimens described as *B. assimilis* de Man, 1922, and synonymized with *B. australis* by Wieser and Hopper (1967) mention the presence of 2 small ventrosublateral teeth in the posterior region of the buccal cavity.

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